THE DESIGN OBSERVER GROUP

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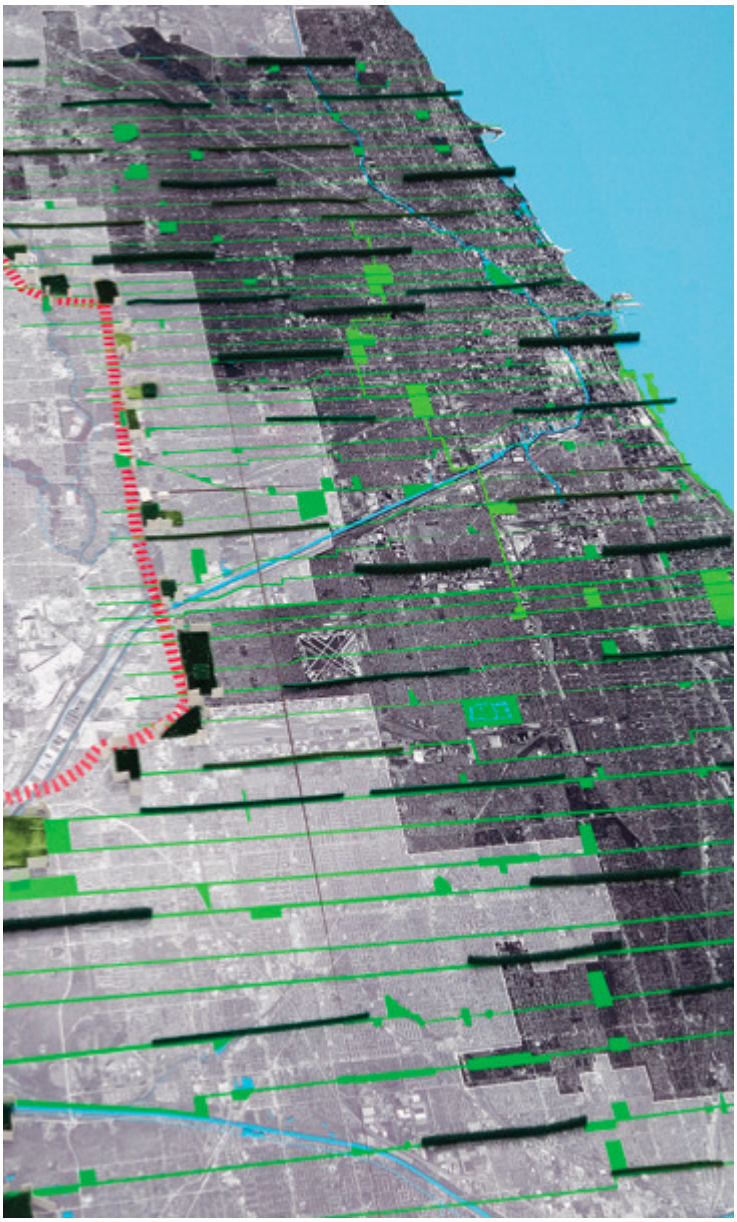
UrbanLab

Growing Water

Growing Water responds to an April 2007 United Nations report predicting that two-thirds of the world's population will face water shortages by 2025 — a situation that will inevitably lead to global conflict. Access to clean water is fundamental to our individual and collective health. We tend to assume that the United States has mostly adequate water resources, yet water scarcity and outright drought occur regularly throughout the country. Shortages are even reported in cities adjacent to the Great Lakes, which hold 20 percent of the Earth's fresh water and 95 percent of the fresh water in the United States.

Global climate change is an additional concern to those who manage fresh water resources. In particular the U.N. panel warned that climate change "could diminish North American water supplies and trigger dispute between the United States and Canada over water reserves already stressed by industry and agriculture." So even in the comparatively water-rich Great Lakes region, global warming could create "more frequent droughts, urban flooding and a scramble for water. . . ."

Our Growing Water project envisions how Chicago might become an model for addressing urban water scarcity and pollution. It assumes that in the near future, clean water will be our most valuable resource: the new oil.



Montage showing the location of new eco-boulevards in the Chicago area.
Photo by Michelle Litvin.

The Facts of Water in Chicago
A subcontinental ridge separates Chicago from its suburbs; this means that surface and groundwater east of the divide flows into Lake Michigan, while water west of the divide flows to the Mississippi River and ultimately the Gulf of Mexico. With this split in mind, Growing Water was inspired by three historic Chicago engineering feats: the reversal of the Chicago River, the deep tunnel, and the city's boulevards and parks.

The Chicago River: In 1892, ground was broken for the 28-mile-long Chicago Drainage Canal (also known as the Sanitary and Ship Canal). Twenty-five-feet-deep and 306-feet-wide, it was larger than both the Suez and Panama canals. New machines to move earth were invented to complete the project, establishing what some called the "Chicago school of earth moving." On January 2, 1900, Chicagoans awoke to discover that the flow of the Chicago River had been permanently reversed, making it the first river to flow away from its mouth. [1]

The Deep Tunnel*:* In the 1970s, a team of engineers sought to solve the city's persistent flooding and water pollution. Their solution was one of the largest engineering schemes ever undertaken: a 109-mile-long system of huge underground tunnels that would intercept sewer and stormwater overflow and convey it to storage reservoirs and treatment plants, from where it would flow onward, over the subcontinental divide to the Mississippi. Today, the deep tunnel has a holding capacity of 15.6 billion gallons of wastewater.

Boulevards and parks: In 1837, Chicago adopted the motto "Urbs in Horto," or "city set in garden"; yet the city's early growth was so rapid and widespread that little or no provision was made for public parks. In a later effort to fulfill the promise of the motto, several large public parks were built and connected to one another via green boulevards. In 1893, the system was dubbed the "Emerald Necklace." Similar boulevard systems were later developed in Boston, Kansas City and Washington, D.C.

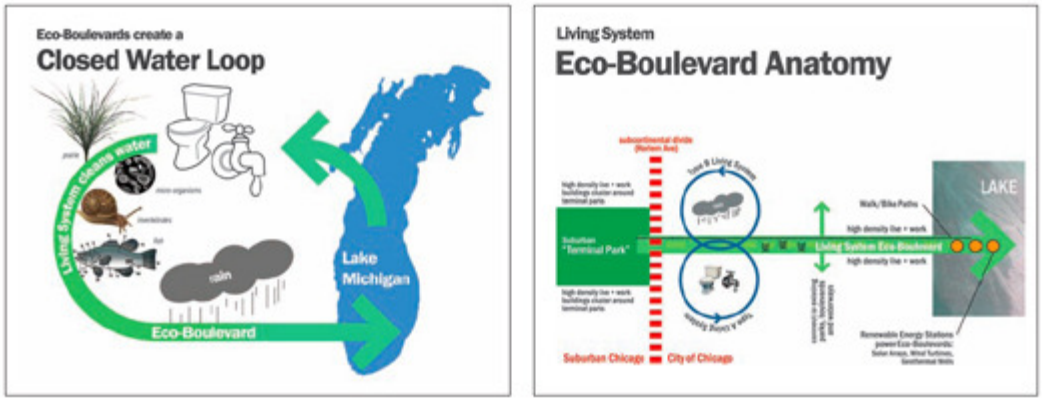
Eco-Boulevards in Chicago
Chicagoans routinely discard — literally flush down the drain — more than one billion gallons of fresh water (extracted from Lake Michigan) per day. This is water that never replenishes the Great Lakes basin; as if it had no value, it is treated and sent via the reversed Chicago River into the Mississippi and on to the Gulf. Growing Water envisions Chicago as a model for recycling and thus increasing its water supply, to be accomplished by creating fifty "eco-boulevards" sited democratically throughout the city.

Essentially, the eco-boulevards would be long strips of publicly owned land transformed from gray infrastructure (roadways and sidewalks) to restored green infrastructure. Green infrastructure is any network of open spaces and conservation land — parks, wetlands, preserves, bioconduits and native landscapes — that naturally manages stormwater and improves water quality. Proponents of such infrastructure encourage community engagement in the conceptualization, design, planting and upkeep of greenway systems. Growing Water's green-infrastructural eco-boulevards would radically increase the environmental health of the city by returning to its lake ecosystem the water extracted from it.

Organized by our office, UrbanLab, the Growing Water team proposes that in the next several years Chicago institute the eco-boulevard concept in order to enhance the city's grid of parks, green boulevards and waterways and also achieve the goal of recycling 100 percent of city-used water. Treated water would be harvested or returned to Lake Michigan to replenish Chicago's most vital natural resource; thus the eco-boulevards would create a closed water loop within the city. They would function as a giant "living machine," an ecological treatment system that uses bio-remediation to remove contaminants from sewage, storm water and waste water. At the scale of a city, a living machine can be understood as green infrastructure, and Growing Water incorporates two types of living machines. Type A would use aquatic and wetland ecological processes to treat wastewater naturally; these would be carried out in reactor tanks in indoor greenhouse conditions. [2] Type B would consist of marshes, wetlands, prairies and forests that would use low-energy processes to biologically filter stormwater. [3]

Growing Water calls for eco-boulevards all across the city, replacing fifty east-west roads and sidewalks, and reaching from Lake Michigan to the subcontinental divide. The ten-mile-long, 66-foot-wide eco-boulevards would ultimately connect and expand Chicago's existing natural landscapes. They would be spaced at every half-mile, making them within a fifteen-minute walk of most residents. The eco-boulevards would also stitch together nearly every possible open space, natural land area and public conservation zone. The majority of north-south vehicular, bicycle and pedestrian pathways that cross the eco-boulevards would remain in order to provide the maximum number of connections within the grid.

The design of each eco-boulevard would adapt to the needs of adjoining neighborhoods. Near commercial zones, eco-boulevards would function as open hardscape plazas and public spaces. Next to residential neighborhoods, they could function as parks. We anticipate that while some eco-boulevards would replace existing roads and sidewalks, the city will maintain a healthy balance of (old) gray and (new) green roadways — and finally achieve the image of its motto, "Urbs in Horto."



Left: The goal is to create a loop returning clean water to Lake Michigan.
Right: The functions of an eco-boulevard.

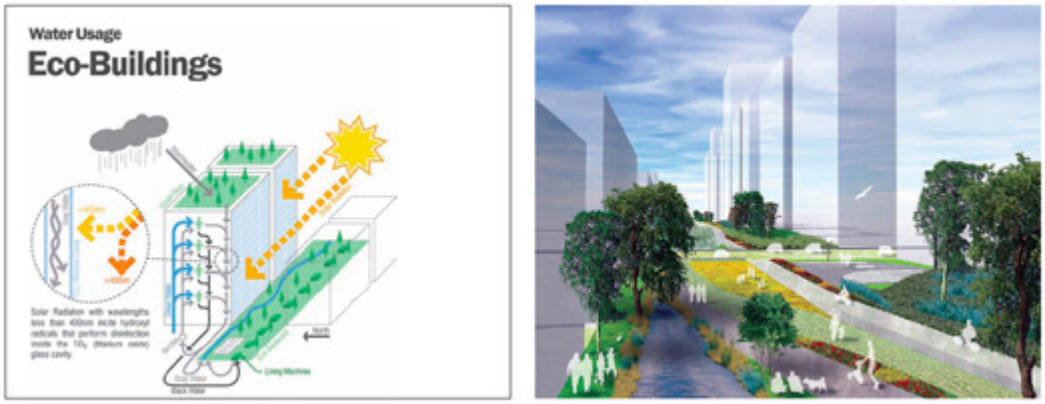
Benefits of Eco-Boulevards
Social: The project would distribute the amenity of green space throughout the city, stitching together historically divided ethnic and economic enclaves. The new public spaces would be used for walking or biking trails, sports fields, and fishing and swimming holes. Additionally, planting beds would allow city residents to micro-farm organic fruits, vegetables and flowers.

Environmental: Beyond producing a more sustainable water system and healthier natural environment, the project would reduce the urban heat island effect, increase organic filtration of air-borne pollutants and carbon dioxide, filter pollutants and heavy metals from rainwater, and increase biodiversity by adding to insect, invertebrate, bird and wildlife habitat.

Sustainable: Renewable energy stations would power the eco-boulevards. These would be prominently positioned within and at the ends of the boulevards (and on small peninsulas in Lake Michigan). Power could be harnessed from the sun, wind, water, solid biomass and geothermal lake energy.

Economic: On a local level, the fingers of open space — the eco-boulevards — would raise adjacent land values significantly, especially in economically depressed areas. A steady, sustainable and safe water supply would allow the city to achieve a level of economic growth that other, less water-endowed cities would be unable to match.

Regional: The eco-boulevards would become social and economic attractors, lined with high-density spaces for living and working. Eco-boulevards would typically extend beyond the western edge of Chicago, to the subcontinental divide, where they would be marked by "terminal parks." These large green spaces would be surrounded by residential and work complexes for suburbanites, who, as water becomes a more expensive and contested resource, would likely seek to move back to the east side of the subcontinental divide.



Left: Water-use principles in eco-buildings.
Right: Rendering of uses along the 31st Street eco-boulevard.

Phasing
The eco-boulevards would be cultivated in each neighborhood, one block at a time, and each would be built to complement its community. Density around the eco-boulevards would increase as new amenities attracted development.

By mid-century, the boulevards would start to connect to each other, as the density of new development increased and the development around them became integral to the growing water loop. At century's end, Chicago would become a holistic living system for harvesting and returning clean water to Lake Michigan.

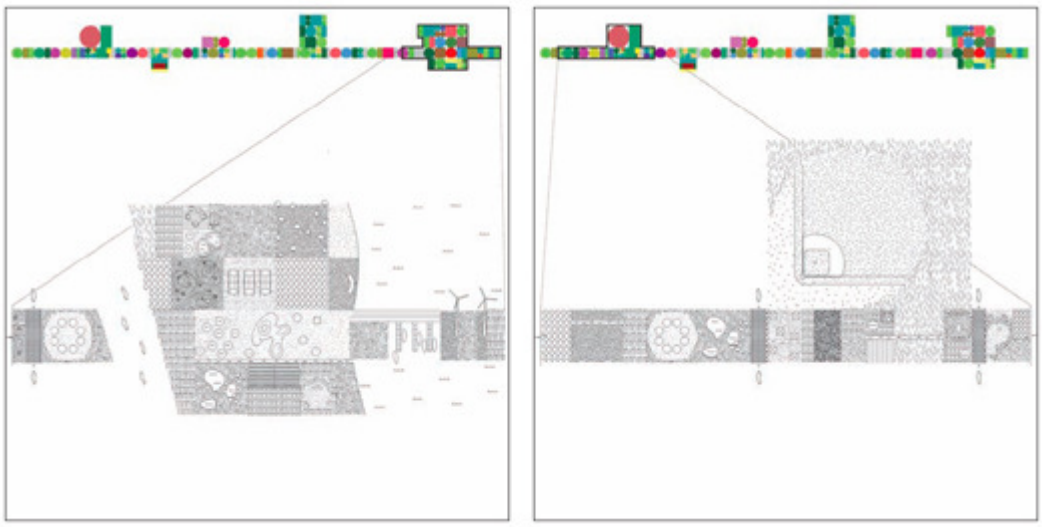
Energy and Clean Water
Interconnectedness between the extraction, use, reuse and cleaning of water from Lake Michigan would be vital to the closed-water-loop concept. Water from the lake would be filtered in several stages before being sent to consumers. "Gray" water (from sinks, showers, etc.) would be disinfected and reused for appropriate purposes — such as irrigation — in its own loop. "Black" water (from toilets) would be cleansed in greenhouse living machines.

Microbial fuel cells in the living machines would harvest naturally occurring energy produced by bacteria during the cleaning process. After being cleaned in the living machines, water would be returned to Lake Michigan through a wetland flow process in the eco-boulevards. [4]

Growing Water Today
Currently, UrbanLab has partnered with the City of Chicago to continue to research, design and develop aspects of the eco-boulevard project. With the Chicago Department of Transportation, we are developing a series of best management practices ("BMPs" to water management specialists).

BMPs are not really practices, performed by people; instead, they are physical green infrastructures that capture and biologically clean stormwater before it enters the sewer system. Typical BMPs consist of vegetated native landscape swales, swells, channels and fields that hold water for a short period to remove contaminants that could pollute a healthy ecosystem. Benefits of BMPs include stormwater harvesting for landscape and species health, and surface water and aquifer recharge.

As green infrastructure, BMPs are often part of plans to reduce reliance on conventional gray infrastructure, thereby reducing urban heat island effects, increasing biodiversity and filtering pollutants. BMPs also provide vital water resources for Chicago's flora and fauna, which are valid users of "our" ecosystem, and are often ignored, even though their well-being underlies the health of the Great Lakes. And reducing the volume of water entering the sewer system will also reduce Chicago's carbon footprint. The Metropolitan Water Reclamation District, which runs the processing plants, is Chicago's single largest energy consumer.



DNA plan segments for a new eco-boulevard.

Why Chicago?
Political will is vital to positive social and environmental change. Because Chicago's environmental health is tied to that of the Great Lakes, the water-based models developed in the city will likely stir political will throughout the region. All of the states and Canadian provinces adjacent to the Great Lakes recently signed a compact (soon to be ratified by U.S. and Canadian legislators) agreeing to cooperative stewardship (such as strict water withdrawal limits) of the Great Lakes. But water stewardship here will mean more than environmental protection; water-reliant activities in the Great Lakes states and provinces bolster one of the largest economies in the world.

About the Project
Growing Water resulted from a one-week ideas competition sponsored by the History Channel. The "Design and Engineering Challenge" asked a group of architects in Chicago, Los Angeles and New York City to conceptualize the future of their cities. Each competition culminated in a reality-TV-style, all-day event in which the teams assembled their projects in front of the public, television cameras and competition juries. Three regional winners were named: UrbanLab, in Chicago; Eric Owen Moss, in Los Angeles; and Architecture Research Office, in New York. Afterward a month-long online vote was conducted with the architect Daniel Libeskind as master of ceremonies. The public selected Growing Water as the national winner.

Notes
UrbanLab is Sarah Dunn + Martin Felsen, with Lee Greenberg, Michael Kmak, Jeff Macias, Kazuya Katagiri, Jan Rehders, Dan Nagy, and Ellen Grimes.

1. Chicago Public Library: www.chipublib.org, 2006.

2. Living Designs Group: www.livingdesignsgroup.com, 2006.

3. Living Designs Group: www.livingdesignsgroup.com, 2006.

4. Diagram derived from work in 2006 at the University of Illinois by Christina Barnas, Peter Pascua, Sean Poust, and Cameron Talischi, with Professor David Lange as advisor.

All images are by UrbanLab except where otherwise noted.